

We Claim:

1. An ion source comprising:

an ionization chamber, said ionization chamber including a vapor entrance aperture for receiving gaseous feed material, an extraction aperture for emitting an ionized beam and one or more electron beams, said one or more electron beams being generally parallel to the plane of said extraction aperture;

one or more electron beam sources, disposed to generate one or more electron beams in a direction generally perpendicular to the plane of said extraction aperture; and

one or more beam steerers for bending said one or more electron beams so that said one or more electron beams travel in a direction generally parallel to the plane of said extraction aperture and are received in said one or more electron entrance apertures.

2. The ion source as recited in claim 1, wherein each of said beam steerers includes a magnetic field source configured to generate a magnetic field in a direction generally perpendicular to said electron beam.

3. The ion source as recited in claim 2, wherein at least one of said one or more electron beam sources is a filament.

4. The ion source as recited in claim 2, further including an anode disposed adjacent each of said electron beam sources.

5. The ion source as recited in claim 4, further including a power supply for maintaining said anode at a fixed voltage potential V_a and said electron source at a fixed voltage potential V_e .

6. The ion source as recited in claim 5, wherein $V_e < V_a$.

7. The ion source as recited in claim 6, further including a pair of base plates disposed adjacent said ionization chamber, each of said base plates including a base plate aperture aligned with said electron entrance apertures defining a gap between said base plates and said ionization chamber.

8. The ion source as recited in claim 7, where the potential of the ionization chamber is maintained at a predetermined value relative to the anode potential forming an electrostatic lens.

9. The ion source as recited in claim 8, wherein the potential of the ionization chamber is maintained at a value $< V_a$ causing the electrostatic lens to act as a decelerating lens.

10. The ion source as recited in claim 1, wherein at least one of said one or more magnetic field sources includes a permanent magnet.